UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

AUG 8 1996

96 AUG 12 AM 10: 32

Ms. Jan Boydstun
Nonpoint Source Program Coordinator
Office of Water Resources
Louisiana Department of Environmental Quality
P.O. Box 82215
Baton Rouge, LA 70884-2215

Dear Ms. Boydstun:

We have completed our review of the Quality Assurance Project Plan (QAPP) for LDEQ's FY 94 NPS project entitled, "Implementation of Best Management Practices for Reducing Input of Nutrients and Sediments from Golf Courses as a Nonpoint Source Pollutant."

We can approve this QAPP provided the enclosed comments and corrections are addressed in a timely manner. This list will not delay the implementation of monitoring because it does not directly affect assessment measures and are strictly format oriented.

We look forward to seeing a timely and successful project. Thank you for your continued efforts concerning Louisiana's Nonpoint Source Management Program. If you should have any questions, please call me anytime at (214) 665-6685.

Sincerely,

Timothy D. Herfel
Project Officer
Grants Section (6WQ-AG)

Enclosure

Golf QAPP Comments

1. Update the Distribution List on page 3 with your name.

2. Update the Signature Page on page 1 with your name.

3. Update the schedule of sampling on page 7.

4. Spelling of course on page 8.

5. Update the sampling frequency on page 11.

6. Verify that the different Standard Methods on the various pages throughout the document are the most recent.

   Example Page 17 (APHA, 1985): If there are newer editions of this method, I would like you to insure this has not changed since 1985.

7. Update the Organization Flowchart with your name.

8. I don't have a signature page with all the signatures of the different participants, just Louis Johnson. Please provide this requirement.

9. Who or what is the "Built Contractor" on the Organizational Flowchart? This needs to be clarified/determined.

10. Christy Higginbotham needs to be on the Organization Flowchart to demonstrate her position.

QUALITY ASSURANCE PROJECT PLAN

Implementation of Best Management Practices for Reducing Input of Nutrients and Sediments from Golf Courses as Non-Point Source Pollutant

NAME OF THE CONTRACTOR

Name: Dr. Kelly A. Rusch, Professor, LSU
Title: Water Sampling and Testing Project Director
Signature and Date: ______

Name: Ms. Christy Higginbotham
Title: Water Sampling and Testing Quality Assurance Manager
Signature and Date: ______

BREC PLANNING AND ENGINEERING

Name: Mr. Ted Jack, Landscape Architect
Title: Project Manager
Signature and Date: ______

Name: Mr. William Palmer
Title: Quality Assurance Officer
Signature and Date: ______

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Name: Andrew Barron
Title: Project Manager
Signature and Date: Andrew Barron 10/23/97

Name: Barbara Romanowsky
Title: Quality Assurance Officer
Signature and Date: Barbara Romanowsky 10/29/97

97 OCT 22 PM 2:10

U.S. ENVIRONMENTAL PROTECTION AGENCY - REGION 6

Name: Mr. Timothy D. Herfel
Title: Project Manager
Signature and Date: ______

Name: Mr. Richard G. Hoppers
Title: Chief, Assistance & Outreach Branch
Signature and Date: ______

A.2. Table of Contents

Project Management

Measurement/Data Acquisition

Assessment/Oversight

Data Validation and Usability

Appendix

A.3. Distribution List

Mr. Ted Jack
BREC Planning & Engineering
P.O. Box 15887
Baton Rouge, LA 70895
(504) 273-6405

Mr. William Palmer
BREC Planning & Engineering
P.O. Box 15887
Baton Rouge, LA 70895
(504) 273-6405

Dr. Kelly Rusch
Department of Civil & Environmental Engineering
Louisiana State University
Baton Rouge, LA 70808
(504) 388-8528

Mr. Andrew Barron
Louisiana Department of Environmental Quality
Office of Water Resources
Water Quality Management Division
P.O. Box 82215
Baton Rouge, LA 70884-2215
(504) 765-0547

Mr. Timothy D. Herfel
Louisiana NPS Project Officer
Grants Section (6WQ-AG, Region 6)
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733
(214) 665-6685

A.4. Project Task/Organization

The organization, coordination and administration of the sampling and testing will be handled by the East Baton Rouge Parish Recreation and Park Commission (BREC) Planning & Engineering Department, overseen by Ted Jack, the Project Manager. The actual sampling and testing work that is to occur at the City Park Lake and Golf Course will be conducted by a group from the Civil & Environmental Engineering Department at Louisiana State University headed by Dr. Kelly A. Rusch, Project Manager of the Sampling Team. Their role will be to conduct the field work, including sediment and water sampling, and to perform all testing as directed by the study parameters, outlined in the Assessment Portion of this document.

The sampling and testing team from LSU will be responsible to provide updates on their sampling and testing progress and their final reports to Ted Jack, Project Manager from BREC Planning & Engineering. Ted Jack will then be responsible for keeping all other parties listed on the Distribution List availed of progress of the sampling and testing project and for providing copies of the final report.

A.5. Problem Definition/Background

The goal of the project is to reduce pollution associated with golf course management and to promote further implementation of BMPs through eductation of golf course owners, managers and clientele. Project objectives to assist in achieving the goals include: (1) implementation of a runoff-control and detention best management practice to reduce the amount of sediment and asociated chemicals reaching the targeted watershed; and (2) education of owners, managers and cleintele through seminars and distribution of appropriate educational materials.

The Bayou DuPlantier watershed in East Baton Rouge Parish, Louisiana, has been targeted for implementation of golf course BMP implementation and education project. Bayou DuPlantier is located within LDEQ's water quality management subsegment 040201 (Bayou Manchac, see Figure E-1). The targeted watershed is located within the Lake Pontchartrain basin. According to the 1993 Louisiana Nonpoint Source Pollution Assessment Report (LDEQ, 1993), the Lake Pontchartrain basin has the second highest number of management subsegments (13), impaired or threatened by polluted runoff associated with urbanization. In a study by Plummer and Associates, Inc. (1983) Baton Rouge ranked second in potential for adversely impacting water quality. The same study ranked the Lake Pontchartrain basin highest in the total number of areas impacted by urban runoff.

The Bayou Manchac subsegment is currently listed as not supporting its designated uses of primary/secondary contact recreation and fish/wildlife propagation (LDEQ, 1993). Suspected causes of impairment include nutrients, siltation, organic enrichment/DO, flow alteration, oil and grease, pathogens and suspended solids. Suspected sources of the pollution are municipal discharges, non-irrigated crop production, road construction and maintenance, land development, combined sewers, wastewater, on-site wastewater systems and hydromodification (LDEQ, 1993). Most of the suspected sources are common in urban areas.

The targeted subwatershed, Bayou DuPlantier, serves a number of functions for the city of Baton Rouge, including stormwater retention and drainage for flood control, green space for wildlife/aquatic life habitat and potentially human recreation. Visual inspection of the bayou indicates a serious solid waste problem. Although not a direct and official cause for water quality impairment, the enormous solid waste problem does in fact impair the aesthetic qualities and recreational capabilities of the waterway. Aesthetics and recreation are both protected under the Louisiana Surface Water Quality Standards.

The headwaters of the bayou support a relatively non-diverse assemblage of gastropods, leeches, crawfish and midges. As the bayou flows through an area that has escaped intensive development, the invertebrate population appears to improve with scuds and dragonfly larvae appearing in the sample collection. It is apparent the bayou suffers from the insults of development and urbanization.

The City Park Golf Course will be the site for BMP implementation. The golf course is situated to the north and adjacent to City Park Lake. The lake is in the headwater drainage area of Bayou DuPlantier (see Figure E-2). The golf course is experiencing severe soil cave-in and erosion problems due to excessive runoff from surrounding residential areas. The sediment-laden runoff and associated chemicals drain directly into City Park Lake. The BMP site location on the golf course is shown on Figure E-3. The site has a relatively steep gradient with failing sloped and associated drainage systems.

In order to reduce runoff-induced erosion and cave-in problems, the site slope and corresponding drainage system will be restabilized. At the base of the site slope, a stormwater detention pond (wet) will be installed. This system will be retrofitted into the existing design of the golf course. A wetland perimeter will be fostered and water-release rate will be controlled. Another problem occurring on the golf course is erosion in the tee and green areas. Restabilization and revegetation will reduce the runoff-induced erosion in the tee and green areas.

On the greens adjacent to the detention pond system, several turf maintenance BMPs will be implemented. These BMPs will reduce the amount of pesticides and nutrients draining into the detention system and ultimately into City Park Lake.

Education of golf course owners and managers will occur through seminar presentations at Turf Management Association meetings. The presentations will provide an overview of the nonpoint source pollution concerns associated with golf course areas and the recommended methods of pollution reduction. Additionally, a detailed review of the BMPs implemented at the City Park Golf Course will be presented. Education of golf course patrons will be through distribution of general and project-specific educational materials at the golf course registration area. The detention pond will be incorporated into the playing area, allowing patrons to observe the structural BMP and how it works. Educational signage for the detention system will also be installed.

This project includes both an educational and a demonstration project component. Each of these components will be evaluated to determine if the educational methods are effective and should be incorporated into a statewide program for golf courses.

A.6. Project/Task Description

The objective of the sampling and testing is to identify the amount of typical urban/suburban pollutants (i.e., *sediments, nutrients,* pesticides, bacteria, organic material and solid waste) currently being introduced into City Park Lake through nonpoint source cycles. Additionally, the sampling will identify the effectiveness of the implementation of best management practices (BMPs) at the City Park Golf Course in reducing the introduction of pollutants. This information will be used to evaluate the effectiveness, both environmentally and economically, of the best management practices in reducing nonpoint source pollutants' introduction into lakes, rivers and streams.

The measurements that we expect to take in the pre-implementation phase of the sampling will probably show high amounts of sediment input into City Park Lake adjacent to the golf course and in the stream running through the golf course. We would also expect tests to indicate higher levels of fertilizer and pesticide input in areas adjacent to the golf course than in areas not adjacent to the golf course.

We would anticipate the measurement of sedimentation input into City Park Lake to fall dramatically following the implementation of BMPs. We would also expect to see a reduction in the measurements indicating fertilizer/pesticides but not as dramatic as the reduction of sedimentation input.

The schedule for the sampling and testing work to be performed for this project at the City Park Lake & Golf Course will be as follows:

Pre-BMP Implementation Sampling and Testing: Nov. & Dec. 1997
(Including Photodocumentation)
Post-BMP Implementation Sampling and Testing: Sept. & Oct. 1998
Pre-BMP Implementation Sampling and Testing Report Due: Feb. 1998
Post-BMP Implementation Sampling and Testing Report Due: Dec. 1998

The actual months of sampling are tentative pending approval of the QAPP from the LADEQ and USEPA.

A.7. Data Quality Objectives for Measurement Data

The major objective of the project is to test various best management practices for turf management on a golf course to reduce input of fertilizers, pesticides and sediment into the watershed via City Park Lake and Bayou DuPlantier. The following parameters have been identified as being critical to the success of the project and will be monitored to evaluate the effectiveness of the implementation of various best management practices.

Sediment

City Park Lake was hydraulically dredged in 1983, resulting in a lake with a mean depth doubling, large increases in volume and detention time, and lowered surface area/volume and watershed area/volume ratios (Malone et al, 1988). Since 1983, sediments have been filling in City Park Lake in part due to sediments from eroding slopes on the City Park Golf Course and from high volumes of stormwater not being handled properly by an inadequate drainage system. We anticipate that stabilizing slopes with appropriate erosion control methods, developing a multiple pond system with a sedimentation basis, and replacing many of the pipes and drop inlets in the existing drainage will result in lowering of sediment introduction and lowering of turbidity rates in City Park Lake.

Fecal Coliform

Testing in 1991 showed high fecal coliform values indicating continued problems with sewage runoff and pet wastes into City Park Lake. We do not believe that waterfowl on the golf course were a significant source of fecal coliform since no significant quantity of waterfowl inhabit the golf course due to the high usage of the course by golfers. Since this project will not specifically addrress the problems associated with sewage runoff into City Park Lake, we hope that education of the public on how pet wastes effect water quality will result in reduction of fecal coliform counts in the water quality tests in City Park Lake.

Total Phosphorous

In water quality testing conducted at City Park Lake in 1991, tests identified high levels of Total Phosphorous (TP) from the golf course stream loading into City Park Lake. Since no data exists measuring the nutrient concentration of the stream coming into the golf course, we will, as part of sampling and testing, be measuring the nutrient concentrations of the stream above the golf course to verify loading from the course. We believe that implementation of best management practices in managing the turf grass on City Park Golf Course will result in lower levels of TP in the stream. We also anticipate that the TP level of water being drained through the multiple pond system, including a wetland perimeter designed to filter nutrients from the adjacent golf course, will result in lower levels of TP in the City Park Lake than in the stream.

Nitrogen

We anticipate a lowering of Nitrogen rates similar to that of Total Phosphorous again due to the implementation of BMPs designed to reduce loading of nutrients into the City Park Lake.

A.10. Documentation and Records

A sample number will be assigned to all samples collected from water, soil and plant clipping samples. They will be sealed with a custody label and transported to the laboratory as soon as possible after collecting. Each sample will contain all appropriate information, i.e., name of organization, date and time of sampling, the person collecting the sample, location, field conditions at the time of sampling, sample ID number, and other remarks. Additionally, a field tracking log will be used to track all samples from the field to the laboratory.

Once delivered to the laboratory, all samples will be logged onto a laboratory tracking report which indicates the sample number, date delivered, responsible party receiving the sample, preparatory analysis required, type and result of analysis performed and the date completed.

Copies of both the field and laboratory tracking reports will be maintained at the LSU Department of Environmental Engineering, since sample collection and delivery to the laboratory will be the responsibility of personnel from the University.

B.1. Sampling Process Design

Laboratory Analyses

The analysis of the water will be conducted by trained laboratory technicians.

Field Sample Collection

Field samples will be collected only by persons trained or otherwise instructed on sampling procedures (i.e., graduate assistant, student worker, BREC staff or university faculty).

Water Sampling - The water sampling will be conducted by the LSU Environmental Engineering Department and will be as outlined in Section B.2. Sampling Methods Requirements.

Sampling Frequency

The first sampling events are scheduled to occur before the construction and implementation of best management practices at the City Park Golf Course and will be compared with existing data to evaluate baseline conditions. The second sampling events will occur after the implementation and construction of the best management practices at the City Park Golf Course to evaluate the effectiveness of the project.

A projected schedule for the first and second sampling events are as follows:
The first sampling event is scheduled for the months of Nov. & Dec. 1997;
The second sampling event is scheduled for the months of Sept. & Oct. 1998.

The actual months of sampling are tentative pending approval of the QAPP from the LADEQ and USEPA.

B.2. Sampling Methods Requirements

Water Sampling

The preparation, preservation and volume requirement for samples are described in Table B-1. Samples for solids will be collected in polyethylene containers. Nutrients (ammonia, TKN and TP) will be collected in polyethylene containers acidified to pH < 2.0 with H_2SO_4; nitrite and nitrate will be acidified to pH < 2, with H_2SO_4, cool 4 degrees C. Fecal coliform samples will be collected in sterile, opaque bottles. All samples will be stored in ice chests for transport to the laboratory.

Table B-1: Preparation, Preservation and Volume Requirements for Samples (APHA, 1989)

PARAMETER	VOLUME REQ'D (L)	SAMPLE CONTAINER MATERIAL	ADVANCE PREPARATION	PRESERVATIVE
CHLa	0.5	Polyethylene	DI/Distilled water washed	Cool in field to 4°C, Filter immediately
FC EC	0.1	Opaque Glass	DI/Distilled water washed, sterilized	0.5 ml 10% $Na_2S_2O_3$ to 500 ml bottle
Nutrients:				
TAN	1.0	Polyethylene	DI/Distilled water washed	H_2SO_4 to pH<2 Cool to 4° C
Nitrite+ Nitrate	0.5	Polyethylene	DI/Distilled water washed	0.08 g $HgCl_2$ Cool to 4° C
TKN TP OP	1.5	Polyethylene	DI/Distilled water washed	H_2SO_4 to pH<2 Cool to 4° C
Solids: TDS TSS VSS	1.0	Polyethylene	DI/Distilled water washed	Cool in field to 4° C
	Total Vol. Req'd. = 4.6 L + FC			

B.3. Sample Handling and Custody Requirements

The collection, preservation and transportation of samples from the field to the laboratory will be conducted according to recommendations by the Standard Methods (APHA, 1995). Collection methodology for routine monitoring sampling was discussed in Section B.2. Sampling Methods Requirements. The transportation of the samples from the site to the lab will be within two hours after the sample collection.

Samples will be labeled according to LADEQ protocol (LADEQ, undated), including an identification code for the sample collector, collection date, location and analysis required.

Samples collected in the field will be documented in the field log book according to appropriate label (labeling system above), field conditions and time of collection.

Upon reaching the laboratory, the samples will be transferred to the analyst who records the field data in the laboratory log book along with time and date of receipt, analyses requirements and pertinent comments. Laboratory logs are permanently bound books assigned to the project analysis group. Once a sample is analyzed, the analyst records the sample number, date and time, calibration data, calculations and concentration in the laboratory log book with his initials. The analyst will then transfer the laboratory data to a final form with adjusted significant figures for submission to LSU's Project Director.

Arrangements will be made such that all the BOD5, fecal coliform and chlorophyll-a samples will be analyzed within 6 hours after the sample collection. For those samples that cannot be analyzed immediately, they will be stored according to the Standard Methods (APHA, 1985).

B.4. Analytical Methods Requirements

Water

Laborabory analyses will follow the procedures recommended in Standard Methods (APHA, 1995) unless designated otherwise and discussed in the QA objectives and measurements (Data Quality Objectives for Measurement Data, Section A.7.).

B.5. Quality Control Requirements

Water

Table B-3 summarizes the analysis techinques to be utilized. All water sampling procedures will follow the recommendations in Standard Mehods (APHA, 1995).

Table B-3: Techniques of Analysis for Water Quality Parameters

PARAMETER	PROCEDURES/ INSTRUMENTS	DETECTION LIMITS (mg/L)	MEASURES
CHLa	Fluorometric, APHA Method 10200H	0.002	Algal Biomass
FC	Membrane Filter APHA Method 9222D	0	Indicator of Sewage Contamination
Ecoli (EC)	Membrane Filter, USEPA 1988	0	Indicator of Sewage Contamination
Ammonia - N (TAN)	Distillation and Nesslerization, APHA Method 4500-NH_3	0.02	Toxicity
DO	Yellow Springs Instrument, Model 57 Oxygen Meter, Approximates APHA Method 4500-OG	0.1	Oxygen Availability
TKN	Digestion, Distillation Nesslerization APHA Method 4500-N-org	0.2	Organic-N and Ammonia
TP	Persulfate Digestion/Ascorbic Acid, APHA Method 4500 PE	0.01	Nutrients (organic P and OP)
OP	Ascorbic Acid, APHA Method 4500 PE	0.01	Nutrients
pH	Cole-Palmer Mini pH Meter, APHA Method 4500-H+B	0.1	Hydrogen Ion Concentration

PARAMETER	PROCEDURES/ INSTRUMENTS	DETECTION LIMITS (mg/L)	MEASURES
TDS	Filtration, Evaporation Drying and Gravimetric APHA Method 2540C	2.5	Dissolved Components
TSS	Filtration, Evaporation Drying and Gravimetric APHA Method 2540D	2.5	Particulates
VSS	Combustion and Gravimetric, APHA Method 2540E	0.1	Organic Particulates
Nitrite + Nitrate	Mollen and Riley Reduction Approximates APHA Method 418C	--	--
Turbidity	Secchi Disk	--	Light Penetration

B.6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Field and laboratory equipment will be maintained clean and in the proper working order. Preventive maintenance on field equipment includes cleaning and care of probes sensitive to drying and encrustation before each use. Sample crews are informed in the care and storage necessary to maintain field equipment. Laboratory equipment is serviced and calibrated according to manufacturer's specifications. Spare parts kept at all times include batteries and probe membranes. Maintenance schedules and inspection reports will be adhered to according to manufacturer's instructions or maintenance contracts.

B.7. Instrument Calibration and Frequency

Water Sample Testing

The field instruments to be used include a Cole Parmer pH, YSI S-C-T meter and YSI portable DO meters. These will be calibrated according to manufacturer's instructions prior to each sampling day.

The laboratory instruments to be used are listed in Table B-4, along with the calibration procedures, frequencies and tolerances for the equipment used for analyses of the proposed parameters.

Table B-4: Calibration of Field and Laboratory Instruments

	CALIBRATION AND TOLERANCE CHECK	
INSTRUMENT	**TIME INTERVAL**	**SPECIFICATION**
Analytical Balance	Weekly	Calibrate 0.1 mg. deviation
pH Meter	Upon Use	Standardize with pH buffer 4.0, 7.0 and 10.0
Dissolved Oxygen Meter	Upon Use	Calibrated and standardized following manufacturer's instructions
Drying Oven	Daily	Record temperature and adjust 103 ± 0.5° C
Water Bath (fecal coliform)	Daily	Record temperature and adjust 44.5 ± .2° C
UV - Vis. Spec.	Upon Use	Set 0% abs. and 100% T

B.8 Inspection/Acceptance Requirements for Supplies and Consumables

Not Applicable

B.9. Data Acquisition Requirements

Not Applicable

B.10. Data Management

Personnel from the LSU Department of Biological and Agricultural Engineering will be responsible for the field data collection and transferring of water samples to the laboratory for analysis. Field data will also be reported to the QA officers in the respective laboratories. The laboratory technicians will be responsible for all laboratory data generated and they will report directly to the QA officer. All field tracking and laboratory tracking reports will be made available to the QA officer who in turn provides this information to the overall Project Manager.

C.1. Assessments and Response Actions

The Quality Assurance Officers (QA) will be responsible for assessments of the sampling and laboratory analytical programs. LSU's QA Manager will approve field sampling and analytical techniques and will ultimately report to the Project Manager. Data not conforming to expected standards will be reviewed and consultations with both field and laboratory technicians will follow in order to determine if there is a possiblility of sample contamination. Samples with data not within acceptable standards and suspected of contamination will be discarded and a fresh sample obtained. The chain of custody procedure is outlined in Section B.3.

C.2. Reports to Management

The Overall Project Manager will be responsible for submitting written reports to LDEQ on a quarterly basis unless otherwise specified. Reports will include an updated progress report, a summary of tasks to be performed before the subsequent progress report and a summary of the data sampled and tested since the last quarterly report.

D.1. Data Review, Validation and Verification Requirements

As discussed previously (Section B.3. Sample Handling and Custody Requirements), the laboratory analyst will perform calculations and calibrations to quantify the concentration on a specific parameter. The data will then be transferred to a final data sheet for submission to LSU's Project Manager.

Verification on calculation and transcriptions will be made by the supervisor. All analyses will be verified for precision compared with standards and QA reagent blanks for all parameters run simultaneously (See Section D.2.).

D.2. Validation and Verification Methods

Quality Control Sample Analysis

The in-house program consists of submission of standards of unkown concentration to analytical staff. These will be determined for all parameters designated in Table B-3 on a monthly frequency. This will assure that the reproducible results in the expected ranges for precision and accuracy are being obtained. Table D-1 lists precision and accuracy objectives for the parameters analyzed in the proposed sampling plan.

Table D-1: Precision and Accuracy Objectives for Water Quality Analyses
(Standard Methods, APHA, 1985)

Parameter	**Precision *Rel. S.D.%**	**Accuracy *Rel. S.D.%**
DO	5	5
Ammonia - N	15	10
Nitrate - N	10	10
Nitrite - N	10	10
TKN	30	20
TP	10	10

*Based upon medium range concentrations

Reagent Blanks

Analyses for all parameters will include a blank to determine background levels or detect contamination of reagents and solvent used in the test. Blanks will be analyzed under the same conditions as the sample.

Standard Curves

All spectrophotometric sample methods require the preparation of a standard curve of absorbance vs. concentration. Replicates of a sample are compared against the standard curve for determination of concentration.

EPA Audits

The external programs are comprised of annual concentration checks of EPA Performance Evaluation Samples obtained from EPA, Region VI (LADEQ, undated). Reported values outside of acceptable ranges will be investigated and remediated.

Preventive Maintenance

Preventive maintenance of field equipment includes the cleaning and care of probes sensitive to drying and encrustation. Sample crews are informed in the care and storage necessary to maintain field equipment. Laboratory equipment is serviced according to manufacturer specifications. Spare parts kept at all times include batteries and probe membranes.

Precision

Acceptable limits, as a percentage of standard deviation, are given by Standard Methods (AHPH, 1985) and listed in Table D-1. Comparison with this table allows the supervisor to detect deviations from these standards.

Accuracy

Data will be compared against values from similar systems with known parameters taken from historical data collection. Values in question will be reviewed and/or resampled to ascertain reliability.

D.3. Reconciliation With Data Quality Objectives

Field sample collection procedures will be established according to LDEQ directives. Routine field sampling procedure will include notation of any unusual occurrences or circumstances that may influence the accuracy or representativeness of the data. Field conditions considered unacceptable by the sampling supervisor may require that additional sampling be done at the designated site.

Laboratory corrective action is the responsibility of the QA Manager and the Project Manager. Close attention to detail, along with spot-checking, will ensure that: (1) samples are correctly gathered, labeled, logged and transferred; (2) appropriate analyses are conducted; (3) instrument maintenance and reliability are ensured; (4) standard curves are correctly prepared and used; and (5) calculations and significant figures are appropriately used to quantify samples. Questionable samples will be reanalyzed.

E.1. Maps

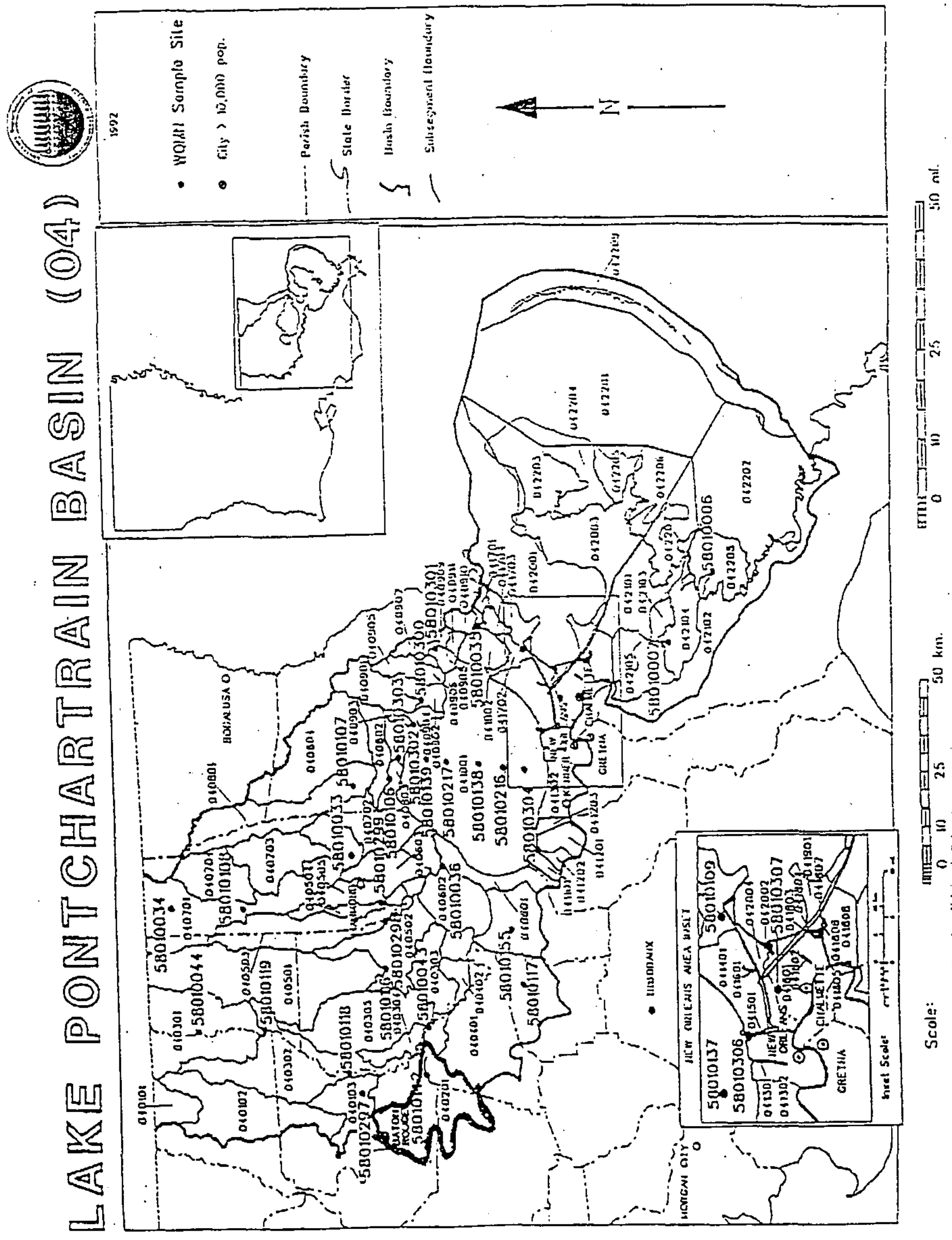


Figure E-1: Location of Bayou DuPlantier Water Quality Management Subsegment of Lake Pontchartrain Basin.

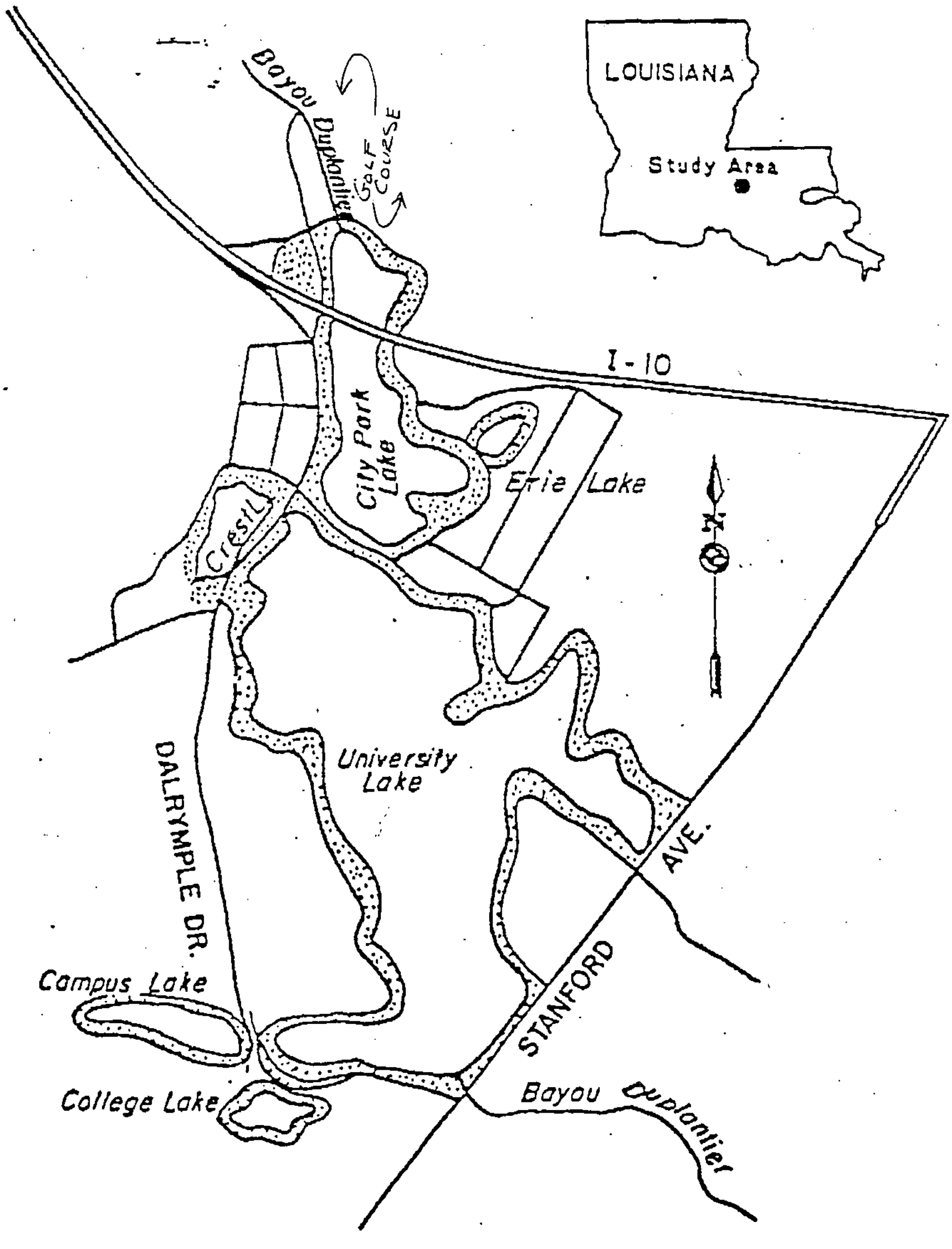


Figure E-2: Site Location Map

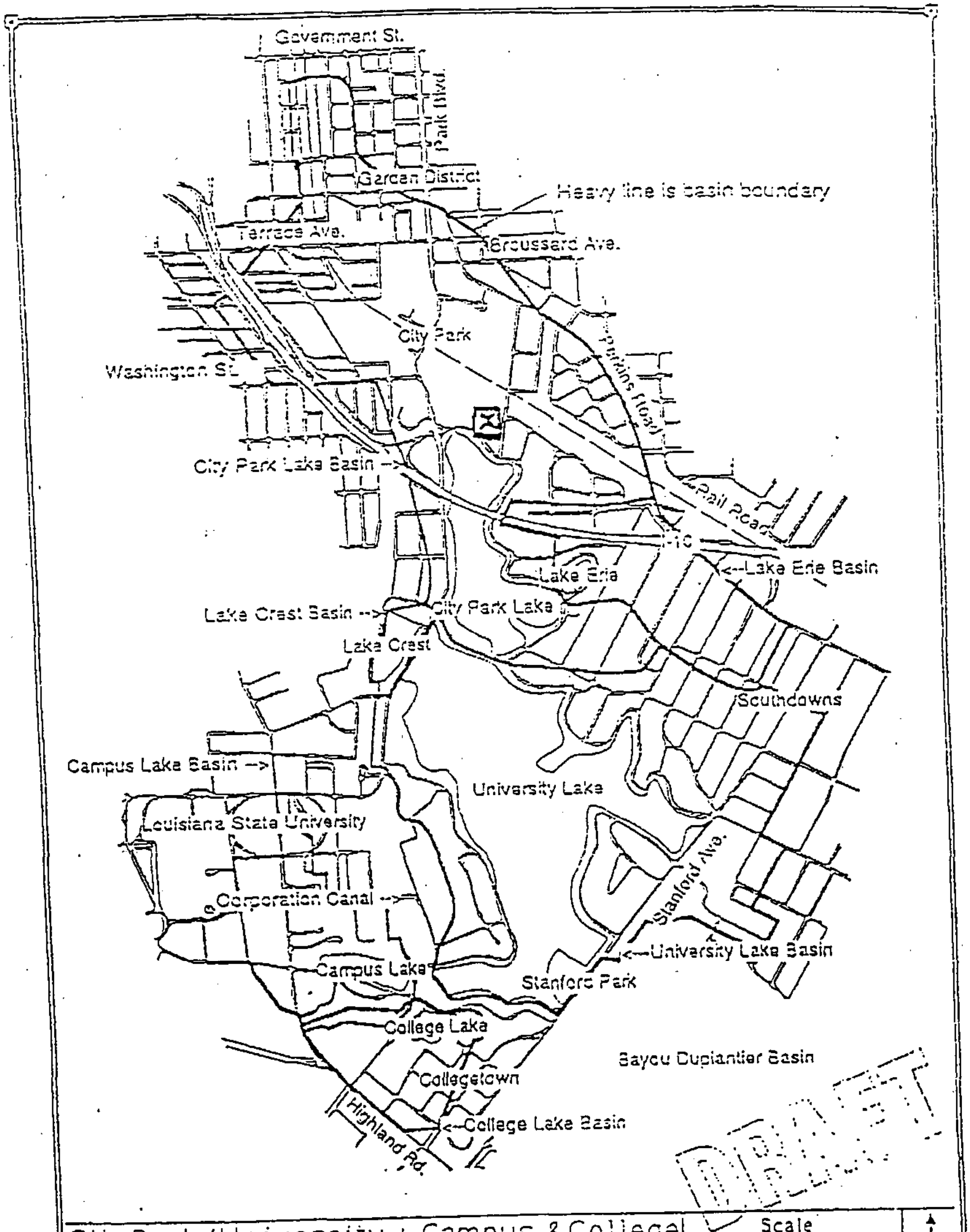


Figure E-3: City Park Lake Drainage Basin

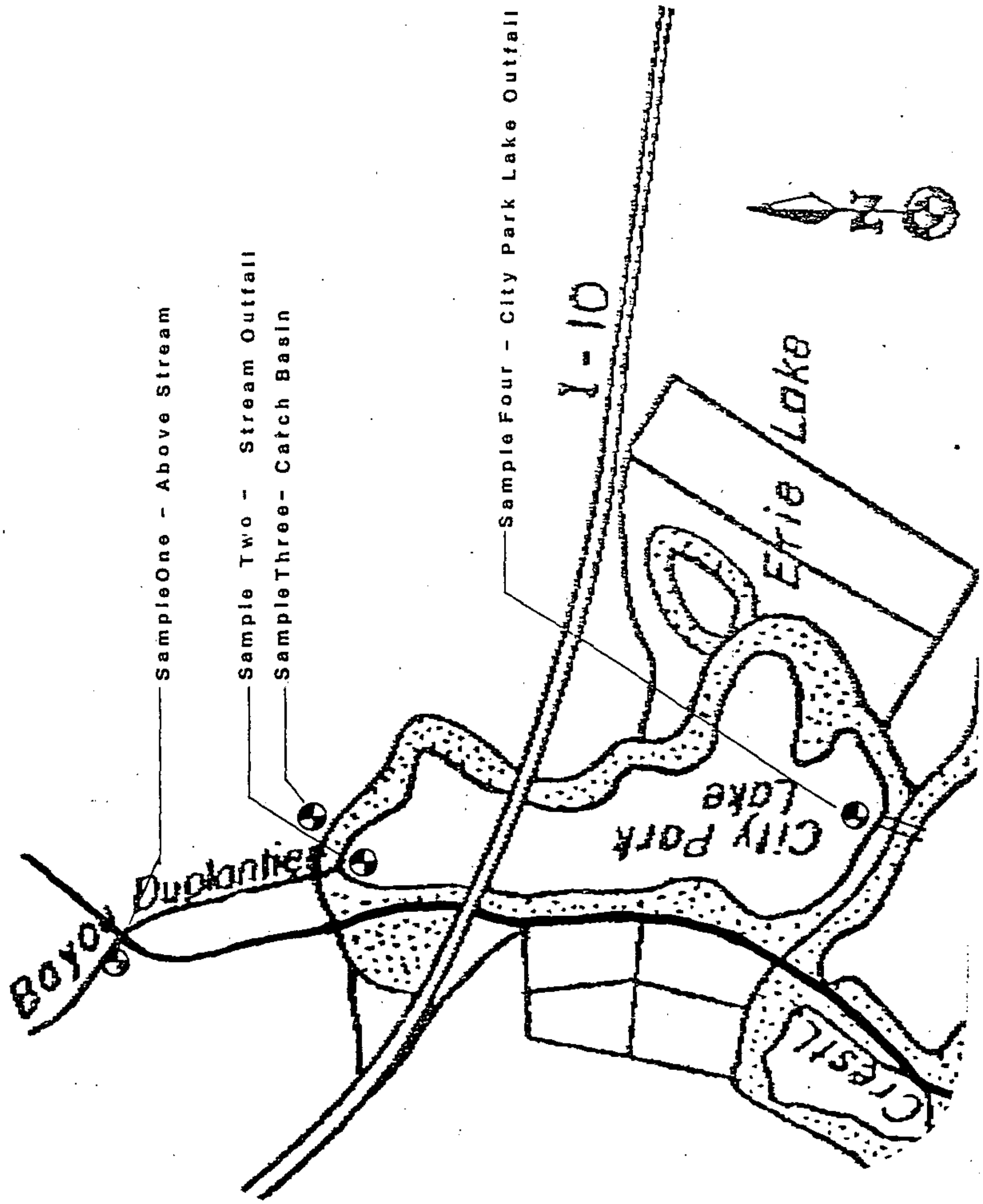
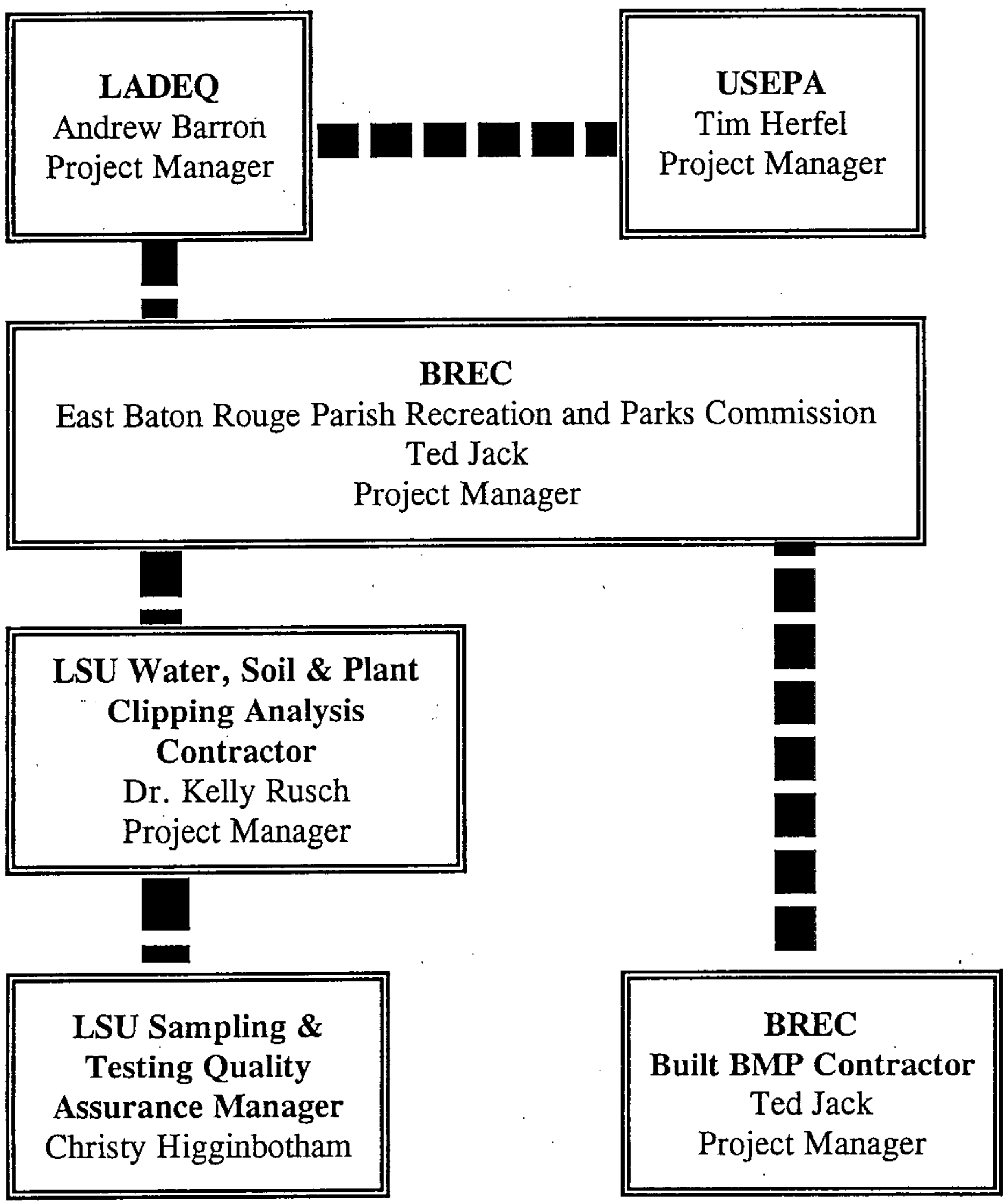


Figure E-4: Location of Proposed Water Quality Analysis Sampling Sites

E.2. Organizational Flow Chart



E.4. References

APHA (American Public Health Association). 1995. Standard Methods for the Examination of Water and Wastewater, 19th edition. Washington, D.C.

Huang, C.Y. and E.E. Schulte. 1985. Digestion of plant tissue for analysis by ICP emission spectroscopy. Communi. Soil Sci. Plant Anal. 16: 943-958.

Jones, J. Jr., B. Wolf, and H.A. Mills. 1991. Plant analysis handbook, a practical sampling, prepartaion, analysis, and interpretation guide. Micro-Macro Publishers. Athens, GA.

LDEQ (Louisiana Department of Environmental Quality). 1993a. State of Louisiana Water Quality Management Plan. Volume 6. Part A. Nonpoint Source Management Program. Office of Water Resources. Baton Rouge, Louisiana.

LDEQ (Louisiana Department of Environmental Quality). 1993b. State of Louisiana Water Quality Management Plan. Volume 6. Part B. Nonpoint Source Management Program. Office of Water Resources. Baton Rouge, Louisiana.

LDEQ (Louisiana Department of Environmental Quality). Undated. Quality Assurance Plan for Water Monitoring and Analysis.

Malone, Ronald F., Knaus, Ronald M., Chapman, Russell L., Gremillion, Paul T., Burden, Daniel G., and Jones Pickard, Julie K. 1988. The Final Report of the University Lakes Restoration Project. Volume 1. Louisiana State University. Baton Rouge, Louisiana.

Malone, Ronald F., Smythe, E. deEtte, and Theegala, Chandra S. 1991. Final Report: University Lakes Post-Restoration Continuing Monitoring Program. Submitted to City of Baton Rouge Department of Public Works. Louisiana State University. Baton Rouge, Louisiana.

Plummer, Alan and Associates, Inc. 1983. Assessment of Urban Stormwater Runoff Effect on Water Quality. Arlington, Texas. Prepared for the Louisiana Department of Natural Resources.

Sweeney, R.A., O. Abara, M. Ansos, L. Cartwright, R.D. Cathey, S. Cook, C. Kamper, P.F. Kane, A. Orcutt, L. Peterson, R.L. Schwarberg, P. Skelton, D.F. Tate, G.I. Willkens. 1989. Generic Combustion Method for determination of crude protein in feeds: Collaborative study. Journal of the Association of Off. Anal. Chem. 72: 770-774.

Thom, William O. And Powell, Jr., A.J. 1994. Sampling Soils with Turfgrass. Soil Sampling Procedures for the Southern Region of the United States. Southern Cooperative Series, Bulletin No. 377, March 1994, pp. 31-34.